CLAIMS

1. A method for adaptive-rate communication, comprising:

setting a first target signal margin with respect to an actual noise level and a second target signal margin with respect to a predetermined noise level;

measuring the actual noise level at a receiver on a communication channel between a transmitter and the receiver; and

selecting a transmission rate at which to transmit a signal on the channel such that for the selected transmission rate, a first signal-to-noise ratio (SNR) of the signal relative to the measured actual noise level is greater than a baseline SNR level by at least the first target signal margin, and a second SNR of the signal relative to the predetermined noise level is greater than the baseline SNR by at least the second target signal margin.

2. A method according to claim 1, wherein the predetermined noise level comprises a worst-case noise level.

3. A method according to claim 2, wherein the communication channel is one of a plurality of channels in a communication system, and wherein selecting the transmission rate comprises calculating the worst-case noise level based on the measured actual noise level on the plurality of the channels, and setting the transmission rate so that the level of the signal is greater than the calculated worst-case noise level by at least the second target signal margin.

4. A method according to claim 3, wherein measuring the actual noise level comprises conveying an indication of the actual noise level from the receiver to the transmitter for use in calculating the worst-case noise level.

5. A method according to claim 1, wherein selecting the transmission rate comprises selecting a maximum rate among a plurality of available rates on the channel at which the first SNR is greater than the baseline SNR level by at least the first target signal margin, and the second SNR is greater than the baseline SNR level by at least the second target signal margin.

6. A method according to claim 5, wherein selecting the maximum rate comprises measuring the level of the signal at each of the plurality of the available rates, and choosing the maximum rate based on the measured level of the signal.

7. A method according to claim 6, and comprising conveying from the receiver to the transmitter an indication of which of the available rates can be used on the channel, based on the measured levels of the noise and the signal at the plurality of the rates, and wherein selecting the transmission rate comprises selecting the transmission rate at the transmitter based on the indication.

8. A method according to claim 1, wherein selecting the transmission rate comprises selecting the rate at which to transmit a digital subscriber line (DSL) signal between a central office and customer premises.

9. A method according to claim 8, wherein the DSL signal comprises a Single-pair High-speed DSL (SHDSL) signal.

10. A method according to claim 1, wherein selecting the transmission rate comprises setting a variable bit-loading rate for the symbols to be transmitted on the channel.

11. A method according to claim 10, wherein selecting the transmission rate comprises setting a baud rate to be used for both upstream and downstream transmissions on the channel, and wherein setting the variable bit-loading rate comprises setting different, respective bit-loading rates for the upstream and downstream transmissions.

12. Communication apparatus, comprising:

a transmitter, configured to transmit a signal over a communication channel at a transmission rate; and

a receiver, adapted to receive the signal over the communication channel, and further adapted to measure an actual noise level on the communication channel, and to cause the transmission rate at which the transmitter is to transmit the signal to be selected such that for the selected transmission rate, a first signal-to-noise ratio (SNR) of the signal relative to the measured actual noise level is greater than a baseline SNR level by at least a first target signal margin, and a second SNR of the signal relative to a predetermined noise level is greater than the baseline SNR by at least a second target signal margin.

13. Apparatus according to claim 12, wherein the predetermined noise level comprises a worst-case noise level.

14. Apparatus according to claim 13, wherein the communication channel is one of a plurality of channels in a communication system, and wherein the worst-case noise level is calculated based on the measured actual noise level on the plurality of the channels.

15. Apparatus according to claim 14, wherein the receiver is adapted to convey an indication of the actual noise level to the transmitter for use in calculating the worst-case noise level.

16. Apparatus according to claim 12, wherein the transmission rate is selected to be a maximum rate among a plurality of available rates on the channel at which the first SNR is greater than the baseline SNR level by at least the first target signal margin, and the second SNR is greater than the baseline SNR by at least the second target signal margin.

17. Apparatus according to claim 16, wherein the receiver is adapted to measure the level of the signal at each of the plurality of the available rates, and wherein the maximum rate is chosen based on the measured level of the signal.

18. Apparatus according to claim 17, wherein the receiver is adapted to convey to the transmitter an indication of which of the available rates can be used on the channel, based on the measured levels of the noise and the signal at the plurality of the rates for use by the transmitter in selecting the transmission rate.

19. Apparatus according to claim 12, wherein the communication channel comprises a digital subscriber line

(DSL) link between a central office and customer premises.

20. Apparatus according to claim 19, wherein the DSL link comprises a Single-pair High-speed DSL (SHDSL) link.

21. Apparatus according to claim 12, wherein the transmission rate is selected by setting a variable baud rate and setting a variable bit-loading rate for the symbols to be transmitted on the channel.

22. Apparatus according to claim 21, wherein the same baud rate is set for both upstream and downstream transmissions on the channel, while different, respective bit-loading rates are set for the upstream and downstream transmissions.

23. A method for bi-directional communication, comprising:

transmitting single-carrier signals comprising data symbols between first and second Digital Subscriber Line (DSL) modems over a communication channel in upstream and downstream directions within respective upstream and downstream transmission spectra that are at least partly mutually overlapping; and

setting different, respective upstream and downstream bit-loading rates for the symbols in the upstream and downstream directions, responsive to conditions on the channel.

24. A method according to claim 23, wherein setting the bit-loading rates comprises setting the upstream bit-loading rate, for the symbols transmitted from the second modem to the first modem, to a lower value than the downstream bit-loading rate, for the symbols

transmitted from the first modem to the second modem, responsive to a noise level at the first modem being higher than the noise level at the second modem.

25. A method according to claim 24, wherein setting the bit-loading rates comprises setting the rates based on the noise level determined before transmitting the signals.

26. A method according to claim 24, wherein transmitting the single-carrier signals comprises transmitting the signals upstream with a range of different values of the upstream bit-loading rate, and wherein setting the bit-loading rates comprises selecting a maximum value of the upstream bit-loading rate in the range that meets a signal-to-noise (SNR) ratio margin criterion at a selected baud rate.

27. A method according to claim 26, wherein transmitting the data symbols comprises transmitting the symbols in the upstream and downstream directions at substantially the same baud rate, which is selected adaptively based on a minimum value of the upstream bit-loading rate in the range.

28. A method according to claim 23, wherein transmitting the data symbols comprises transmitting the symbols in the upstream and downstream directions at substantially the same baud rate and using a standard modulation scheme common to the upstream and downstream directions.

29. Apparatus for bi-directional communication, comprising first and second Digital Subscriber Line (DSL) modems, mutually linked by a communication channel, the first modem being adapted to transmit downstream over the

communication channel to the second modem a first single-carrier signal having a downstream transmission spectrum, the first single-carrier signal comprising first data symbols and having a downstream bit-loading rate, and the second modem being adapted to transmit upstream over the communication channel to the first modem a second single-carrier signal having an upstream transmission spectrum that at least partly overlaps the downstream transmission spectrum, the second single-carrier signal comprising second data symbols with an upstream bit-loading rate lower than the downstream bit-loading rate, wherein the upstream and downstream bit-loading rates are selected responsive to conditions on the channel.

30. Apparatus according to claim 29, wherein the upstream bit-loading rate is set lower than the downstream bit-loading rate responsive to a noise level at the first modem being higher than the noise level at the second modem.

31. Apparatus according to claim 30, wherein the bit-loading rates are set based on the noise level determined before transmitting the signals.

32. Apparatus according to claim 30, wherein the upstream bit-loading rate is selected by transmitting the second single-carrier signal upstream with a range of different values of the upstream bit-loading rate, and selecting a maximum value of the upstream bit-loading rate in the range that meets a signal-to-noise (SNR) ratio margin criterion at a selected baud rate.

33. Apparatus according to claim 29, wherein the first and second modems are controlled so as to transmit the

symbols in the upstream and downstream directions at substantially the same baud rate and using a standard modulation scheme common to the upstream and downstream directions.